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PTO/SB/05 (4/98)  
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# UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))

Attorney Docket No. **503.38077X00**

First Inventor or Application Identifier **Masaya ICHINOSE, ET AL.**

Title **ELECTRIC POWER VARIATION COMPENSATING DEVICE**

Express Mail Label No.

## APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. ☒ \* Fee Transmittal Form (e.g., PTO/SB/17)  
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(preferred arrangement set forth below)
  - Descriptive title of the Invention
  - Cross References to Related Applications
  - Statement Regarding Fed sponsored R & D
  - Reference to Microfiche Appendix
  - Background of the Invention
  - Brief Summary of the Invention
  - Brief Description of the Drawings (if filed)
  - Detailed Description
  - Claim(s)
  - Abstract of the Disclosure
3. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets **6**]
4. Oath or Declaration [Total Pages **2**]
  - a. ☒ Newly executed (original or copy)
  - b. ☐ Copy from a prior application (37 C.F.R. § 1.63(d))  
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Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).

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5. ☐ Microfiche Computer Program (Appendix)
6. Nucleotide and/or Amino Acid Sequence Submission  
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## ACCOMPANYING APPLICATION PARTS

7. ☒ Assignment Papers (cover sheet & document(s))
8. ☐ 37 C.F.R. § 3.73(b) Statement (when there is an assignee) ☒ Power of Attorney
9. ☐ English Translation Document (if applicable)
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## TITLE OF THE INVENTION

## ELECTRIC POWER VARIATION COMPENSATING DEVICE

## BACKGROUND OF THE INVENTION

## 5 1. FIELD OF THE INVENTION

The present invention relates to an electric power variation compensating device which compensates a variation of an active electric power of wind power (turbine) generators outputted to an electric power system through a control of an electric power converter disposed in parallel with the wind power generators.

## 2. CONVENTIONAL ART

15 As one of these sorts of conventional devices, Amano et al. "Study on Power Fluctuation Compensation of Wind-Turbine Generators by NAS Battery Systems" (1998 National Convention Record [7] I.E.E. JAPAN, pp 7-310~7-311) discloses a detection of an active electric power outputted from a wind power generation system and a detection of an active electric power inputted or outputted from an electric power energy storage device through separate current and voltage detectors, and further discloses a control of an electric power converter constituting the electric power energy storage device in which a detected value of electric power of the wind power generation system

is inputted respectively to a high frequency pass filter and a low frequency pass filter to divide the electric power into long period variation components and short period variation components to perform a  
5 phase compensation and a gain calculation for the respective components, and the resultant components are added to a charge and discharge command in the control system of the electric power converter.

As has been explained above, since the respective  
10 active electric powers of the wind power generation system and the electric power energy storage system are detected separately in the conventional art, there arises a problem that when installing a plurality of wind power generating systems, detecting points  
15 thereof increase.

Further, since the active electric power of the wind power generating system is compensated while dividing the same into long period variation components and short period variation components, it  
20 is difficult to compensate all of the variation components with the electric power energy storage system.

Still further, if it is difficult to set the gain of the system at 1 because of a small capacity of the  
25 electric power energy storage system, there arises a problem that all of the electric power variation components can not be compensated.

## SUMMARY OF THE INVENTION

An object of the present invention is to provide an electric power variation compensating device which is suitable for suppressing any variation components  
5 in an active electric power outputted to an electric power system when an electric power energy storage system is installed in parallel with a plurality of wind power generating systems.

The above object is resolved in the following  
10 manner in which the output electric power of the plurality of wind power generators is computed according to a detection value of a composite current and a voltage of an electric power system as well as an input or output electric power of an electric power  
15 converter is computed according to the voltage of the electric power system and a detected value of current of the electric power converter or a detected value of current of the electric power system, further an amount of electric power used for electric power feed-  
20 back in a control system is one obtained by adding either the active electric power or the reactive electric power in the output electric power of the wind power generators each of which low frequency components are excluded through a low frequency pass  
25 filter to either the active electric power or the reactive electric power in the input or output electric power of the electric power converting

device, and still further are provided a change-over switch which makes or interrupts the active electric power or the reactive electric power in the output power of the plurality of wind power generators, and  
5 another change-over switch which makes or interrupts low frequency components of the active electric power or the reactive electric power in the output electric power of the plurality of wind power generators.

10 BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram of an electric power variation compensating device representing one embodiment of the present invention;

Fig. 2 is a block diagram showing a detailed  
15 structural diagram of a control unit according to the present invention;

Fig. 3 is a diagram for explaining an electric power variation compensation according to the present invention;

20 Fig. 4 is another diagram for explaining an electric power variation compensation according to the present invention;

Fig. 5 is a diagram for explaining an electric power variation according to a conventional type  
25 device;

Fig. 6 is a block diagram of another embodiment of the present invention;

Fig. 7 is a block diagram showing a detailed structural diagram of another control unit in Fig. 6 embodiment of the present invention;

Fig. 8 is a block diagram of a modification example when a superconducting magnetic energy storage device is used as the electric power energy storage device of the present invention;

Fig. 9 is a block diagram of another modification example when a static var compensating device (SVC) is used as the electric power energy storage device of the present invention; and

Fig. 10 is a block diagram of still another modification example when an adjustable speed electric power generating system is used as the electric power energy storage device of the present invention.

#### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Hereinbelow, embodiments of the present invention are explained with reference to the drawings.

Fig. 1 shows an electric power variation compensating device representing one embodiment of the present invention, in that in Fig. 1, the embodiment is shown which realizes a compound system of a wind power generating system 19a and an electric power energy storage use electric power conversion system 7a according to the present invention.

In Fig. 1, a wind power generator 1a is connected

to a coupling use transformer 3a via an inverter/converter 2a, and the coupling use transformer 3a is connected to an electric power system 18. The inverter/converter 2a once converts an active electric power  $P_{wa}$  outputted from the wind power generator 1a into a DC electric power and then inverts the same into an AC electric power by the inverter to supply the active electric power to the electric power system 18. Further, another wind power generator 1b is connected to the coupling use transformer 3a and an active electric power  $P_{wb}$  outputted from the wind power generator 1b is also supplied to the electric power system 18.

An electric power energy storage device 4a is constituted as an electric power energy storage system by installing secondary batteries 5a and 5b at DC circuit portions of inverters 6a and 6b, and the inverters 6a and 6b are controlled through an inverter control unit 11a and an active electric power  $P_c$  from the electric power energy storage device 4a is supplied to the electric power system 18 via a coupling use transformer 3b.

An electric power detector 10a computes, according to an output current  $I_w$  of a current detector 8a and an output voltage  $V_s$  of a voltage detector 9a, electric powers  $P_w$  and  $Q_w$  outputted from a plurality of wind power generators (in Fig. 1, 1a

and 1b) to the electric power system 18. Further, another electric power detector 10b computes, according to an output current  $I_c$  of a current detector 8b and the output voltage  $V_s$  of the voltage detector 9a, electric powers  $P_c$  and  $Q_c$  inputted or outputted to and from the electric power energy storage device 4a. Thus obtained active electric powers  $P_w$  and  $P_c$  and reactive electric powers  $Q_w$  and  $Q_c$  are inputted to the inverter control unit 11a for the electric power energy storage device 4a.

Fig. 2 shows a detailed structure of the inverter control unit 11a for the electric power energy storage device 4a. The composite electric powers  $P_w$  and  $Q_w$  of the plurality of wind power generators 1a and 1b are inputted through respective switches A and B. Further, the active electric power  $P_w$  is also inputted into a low frequency pass filter 12a and an output  $P_{wL}$  of the low frequency pass filter 12a is inputted into a switch C. The switch C outputs the output  $P_{wL}$  to a subtracter 14a. The subtracter 14a computes a difference between the output of the switch A and the output of the switch C and outputs the difference to an adder 15a. The adder 15a adds the output active electric power  $P_c$  of the electric power energy storage device 4a and the resultant output of the subtracter 14a, and computes an active electric power feed back value  $pf$ , and with another subtracter 14b a difference



between an active electric power command  $p^*$  and the active electric power feed back value  $p_f$  is computed. Likely, the reactive electric power  $Q_w$  is inputted via the switch B and another adder 15b adds the reactive electric power  $Q_c$  inputted into or outputted from the electric power energy storage device 4a and the output from the switch B to compute a reactive electric power feed back value  $Q_f$ , and with still another subtracter 14c a difference between a reactive electric power command  $Q^*$  and the reactive electric power feed back value  $Q_f$  is computed. The outputs of the subtracters 14b and 14c are inputted into a current controller 13a, and from the current controller 13a gate pulses 16a for the converters 6a and 6b are outputted.

When all of the switches A, B and C are ON condition, the active electric power feed back value  $P_f$  results in an addition of the active electric power  $P_c$  and high frequency components of the composite active electric power  $P_w$ . Accordingly, the electric power energy storage device 4a is controlled so that the high frequency components of the active electric power  $P_w$  outputted from the wind power generating system 19a are charged/discharged from the batteries 5a and 5b, thereby the high frequency components in the active electric power  $P_w$  which otherwise flow out into the electric power system 18 are suppressed.

Now, when assuming that the high frequency

components and the low frequency components of the active electric power  $P_w$  are as  $P_{wH}$  and  $P_{wL}$  respectively, since the subtracter 14a subtracts  $P_{wL}$  in  $P_w$  ( $P_{wH}$ ,  $P_{wL}$ ), the output of the subtracter 14a gives  $P_w$  ( $P_{wH}$ ). The adder 15a adds the output  $P_w$  ( $P_{wH}$ ) of the subtracter 14a to the output active electric power  $P_c$  of the electric power energy storage device 4a to obtain the active electric power feed back value  $P_f$ , namely  $P_c + P_w$  ( $P_{wH}$ ). The subtracter 14b computes a deviation  $\Delta p_H$  between the active electric power command  $p^*$  and the active electric power feed back value  $p_f$ . Based on the computed deviation  $\Delta p_H$  the current controller 13a outputs the gate pulses 16a for the converters 6a and 6b. The converters 6a and 6b are controlled so that the high frequency components  $P_{wH}$  in the active electric power  $P_w$  are charged/discharged into the batteries 5a and 5b. As a result, the high frequency components  $P_{wH}$  in the active electric power  $P_w$  which possibly flow out into the electric power system 18 are suppressed.

Fig. 3 shows a relationship between the output active electric power  $P_w$  of the plurality of wind power generators, the low frequency pass filter output  $P_{wL}$  and an active electric power  $P_{sys}$  ( $=P_{wL} + p^*$ ) which the compound system of the wind power generation and electric power energy storage outputs into the electric power system 18, when all of the switches A,

B and C are in ON condition. Since the electric power energy storage device 4a is operated so that the high frequency components in the active electric power  $P_w$  from the wind power generating system 19a are eliminated, the active electric power  $P_{sys}$  assumes a value obtained by adding the active electric power command value  $p^*$  for the electric power energy storage device 4a to the low frequency components  $P_{wL}$  in the active electric power  $P_w$ . In this instance whether the charging operation or the discharging operation to be performed by the electric power energy storage device 4a, can be determined by varying the active electric power command value  $p^*$ . With regard to the reactive electric power, since the switch B is ON, the reactive electric power at the coupling point between the wind power generating system 19a and the electric power energy storage device 4a is controlled so as to meet with the command value  $Q^*$ .

Fig. 4 shows another relationship between the same, when the switch A is ON and the switch C is OFF. In this instance, since the active electric power  $P_w$  of the wind power generating system 19a is added to the detected value  $P_c$  of the active electric power of the electric power energy storage device 4a, the electric power energy storage device 4a operates so as to charge or discharge all of the varying components in the active electric power. Accordingly, the

control unit 11a of the electric power energy storage device 4a operates so as to keep the active electric power of the entire compound system of the wind power generation and electric power energy storage at the  
5 constant value  $p^*$ .

Fig. 5 shows still another relationship between the same, when the switches A and C are OFF which is incidentally an operating example of a conventional type device wherein the output active electric power  
10  $P_c$  of the electric power energy storage device 4a and the active electric power  $P_w$  of the wind power generating system 19a are controlled separately, therefore, the active electric power  $P_{sys}$  represents the addition of the output active electric power  $P_c$   
15 and the active electric power  $P_w$ .

As has been explained above, through changing-over the switches as shown in Figs. 3 and 4, the active electric power of the compound system of the wind power generation and electric power energy  
20 storage is caused to follow up the low frequency components in the active electric power of the wind power generating system to achieve an operating state in which only the high frequency components are compensated or alternatively an operating state in  
25 which all of the active electric power components of the wind power generating system are compensated, can be achieved. In particular, when the electric power

energy storage device 4a does not have a sufficient capacity which can charge all of the electric power of the wind power generating system 19a, an operation which compensates only the high frequency components through changing over switches is effective.

In the present embodiment, since the electric power of not less than two wind power generators is determined according to the composite current and the voltage of the electric power system 18, one set of detection system is sufficient regardless to the number of wind power generators. Further, when adding one or more wind power generators, it is unnecessary to newly add another detection system.

Further, since the detected value of the active electric power of the wind power generating system of which low frequency pass filter output is subtracted is added to the active electric power feed back value of the electric power energy storage device, the high frequency components in the active electric power which otherwise flow out into the electric power system are absorbed by the electric power energy storage device and varying components in the active electric power which will be outputted into the electric power system can be suppressed.

Still further, since the switches are provided on the transmission lines of the detected values of electric power of the wind power generators and of the

low frequency pass filter so as to permit change-over, it is possible to cause to follow up the active electric power of the compound system of the wind power generation and electric power energy storage to the low frequency components as well as to cause to perform a compensating operation for all of the active electric power components of the wind power generating system.

Now, other embodiments of the present invention will be explained hereinbelow. Throughout the respective drawings equivalent constituting elements as in the previous embodiment are designated by the same reference numerals and their explanation is omitted.

Fig. 6 is another embodiment according to the present invention which realizes a compound system of a wind power generating system and an electric power energy storage use electric power converting system.

The present embodiment is different from Fig. 1 embodiment in the following points, in that in place of the current detector 8b of the electric power energy storage system 7a in Fig. 1 embodiment, the current in the electric power system 18 is detected by a current detector 8d, and the electric powers  $P_{sys}$  and  $Q_{sys}$  in the electric power system 18 and the detected values  $P_w$  and  $Q_w$  of the electric power of the wind power generating system 19b are fed back to a

control unit 11b constituting an electric power energy storage system 7b.

Fig. 7 shows a detailed structure of the control unit 11b of the present embodiment. Since the electric powers  $P_{sys}$  and  $Q_{sys}$  in the electric power system 18 are respectively subtracted by the electric powers  $P_w$  and  $Q_w$  at subtracters 14d and 14e, the outputs of the subtracters 14d and 14e respectively give the active electric power  $P_c$  and the reactive power  $Q_c$  which are inputted or outputted to and from an electric power energy storage device 4b.

With the present embodiment, substantially the same advantages as has been obtained by Fig. 1 embodiment are also obtained.

Fig. 8 is a modification example of the present invention in which a superconducting magnetic energy storage device 17a which absorbs or discharges an electric power is applied for the electric power energy storage device 4a in Fig. 1 embodiment. In Fig. 8, the superconducting magnetic energy storage device 17a is connected to the electric power system 18. Further, at the DC circuit portion of an electric power converter 6e a superconductor coil 21 is installed and the superconducting magnetic energy storage device 17a absorbs or discharges an electric power from and to the electric power system 18 according to a command from a control unit 11c.

The voltage of the electric power system 18 is detected by a voltage detector 9c and currents concerned are detected by current detectors 8e and 8f. Electric power detectors 10d and 10e compute electric  
5 powers according to the detected voltage and currents, and output the computed results to a control unit 11c. The control unit 11c outputs gate pulses 16c and controls the superconducting magnetic energy storage device 17a.

10 Other than the above superconducting magnetic energy storage device 17a, a static var compensating device (SVC) 17b as illustrated in Fig. 9 can be used. At the DC circuit portion of an electric power converter 6f in the static var compensating device 17b  
15 a capacitor 22a is installed, and the static var compensating device 17b absorbs or discharges an electric power from and to the electric power system 18 according to a command from a control unit 11d.

Further, in place of the superconducting magnetic  
20 energy storage device 17a, an adjustable speed electric power generating system can be used. As such adjustable speed electric power generating system a pumping up electric power generating installation and a fly-wheel type electric power generating system 17c  
25 as illustrated in Fig. 10 are exemplified. The fly-wheel type electric power generating system 17c charges a capacitor 22b through an electric power



converter 6h, and another electric power converter 6g uses the electric power of the capacitor 22b for secondary excitation of a generator-motor 23. The rotatable shaft of the generator-motor 23 is coupled  
5 with a fly-wheel 24, and further the primary side of the generator-motor 23 is connected to the electric power system 18 via a transformer 3h. The present fly-wheel type electric power generating system 17c absorbs or discharges an electric power from and to  
10 the electric power system 18 according to a command from a control unit 11e.

Hereinabove, it has been explained that when an electric power energy storage system is provided in parallel with a plurality of wind power generating  
15 systems, varying components in the active electric power which will be outputted to an electric power system are suppressed. The present invention is likely applicable with regard to a reactive electric power.

20 As has been explained above, according to the present invention, when an electric power energy storage system is installed in parallel with a plurality of wind power generating systems, through provision for the electric power energy storage system  
25 of a function which absorbs or discharges high frequency components outputted from the wind power generators, the varying components in the active

electric power outputted into an electric power system are suppressed and the electric power energy storage system can be stably operated with regard to charging and discharging thereby.

5 Further, since the electric power of not less than two wind power generators is determined according to the composite current thereof and the voltage of the electric power system, one set of detection system is sufficient regardless to the number of wind power  
10 generators, as well as when adding one or more wind power generators to the system, it is unnecessary to newly install another detection system, therefore, in the compound system of a wind power generating system and an electric power energy storage system number of  
15 detectors can be reduced which achieves cost reduction of the system.

Still further, because of the measure in which the low frequency pass filter output is subtracted from the detected value of the active electric power  
20 of the wind power generating system, the high frequency components in the active electric power flowing out into the electric power system are eliminated with a simple structure and the varying components in the active electric power which will be  
25 outputted into the electric power system can be suppressed.

Moreover, because of the provision of the

switches in the control system, the mode of electric power detection can be exchanged, the active electric power of the compound system of a wind power generation and an electric power energy storage is  
5 caused to follow up the low frequency components of the wind power generating system to thereby compensate only the high frequency components thereof as well as the operating condition can be created which performs a compensating operation for all of the active  
10 electric power components of the wind power generating system.

Further, with regard to the reactive electric power components substantially the same compensation can be effected.

## CLAIMS

1. An electric power variation compensating device in a compound system of a wind power generation and an electric power energy storage including a wind power generator and an electric power energy storage device and an electric power converting device provided in parallel therewith, characterized in that the electric power variation compensating device comprises means (8a) for detecting a composite current ( $I_w$ ) of the wind power generator (1a, 1b); means (9a) for detecting a voltage ( $V_s$ ) of an electric power system (18) to which the wind power generator (1a, 1b) and the electric power energy storage device (4a) and the electric power converting device (6a, 6b) are connected; and means (8b) for detecting a current ( $I_c$ ) either inputted into or outputted from the electric power converting device (6a, 6b); wherein an output electric power ( $P_w$ ,  $Q_w$ ) of the wind power generator (1a, 1b) is computed according to the detected voltage ( $V_s$ ) of the electric power system (18) and the detected composite current value ( $I_w$ ) as well as an input or output electric power ( $P_c$ ,  $Q_c$ ) of the electric power converting device (6a, 6b) is computed according to the detected voltage ( $V_s$ ) of the electric power system (18) and the detected current value ( $I_c$ ) of the electric power converting device (4a), and the

computed output electric power ( $P_w$ ,  $Q_w$ ) of the wind power generator (1a, 1b) and the computed input or output electric power ( $P_c$ ,  $Q_c$ ) of the electric power converting device (6a, 6b) are used as an electric power feed-back in a control system (11a) for the electric power converting device (6a, 6b).

2. An electric power variation compensating device in a compound system of a wind power generation and an electric power energy storage including a wind power generator and an electric power energy storage device and an electric power converting device provided in parallel therewith, characterized in that the electric power variation compensating device comprises means (8c) for detecting a composite current ( $I_w$ ) of the wind power generator (1c, 1d); means (9b) for detecting a voltage ( $V_s$ ) of an electric power system (18) to which the wind power generator (1c, 1d) and the electric power energy storage device (4b) and the electric power converting device (6c, 6d) are connected; and means (8d) for detecting a current in the electric power system (18); wherein an output electric power ( $P_w$ ,  $Q_w$ ) of the wind power generator (1c, 1d) is computed according to the detected voltage ( $V_s$ ) of the electric power system (18) and the detected composite current value ( $I_w$ ) as well as an input or output electric power ( $P_c$ ,  $Q_c$ ) of the electric power converting device (6c, 6d) is computed

according to the detected voltage ( $V_s$ ) of the electric power system (18) and the detected current value of the electric power system (18), and the computed output electric power ( $P_w$ ,  $Q_w$ ) of the wind power generator (1c, 1d) and the computed input or output electric power ( $P_c$ ,  $Q_c$ ) of the electric power converting device (6c, 6d) are used as an electric power feed-back in a control system (11b) for the electric power converting device (6c, 6d).

10        3. An electric power variation compensating device according to claim 1 or claim 2, characterized in that an amount of the electric power used for the electric power feed-back in the control system (11a, 11b) is a value ( $P_f$ ,  $Q_f$ ) in which either the active  
15 electric power ( $P_w$ ) or the reactive electric power ( $Q_w$ ) in the output electric power of the wind power generator (1a, 1b, 1c, 1d) each of which low frequency components ( $P_{wL}$ ) are excluded through a low frequency pass filter (12a, 12b) is added to either the active  
20 electric power ( $P_c$ ) or the reactive electric power ( $Q_c$ ) in the input or output electric power of the electric power converting device (6a, 6b, 6c, 6d).

25        4. An electric power variation compensating device according to claim 3, characterized in that either the active electric power ( $P_c$ ) or the reactive electric power ( $Q_c$ ) in the input or output electric power of the electric power converting device (6a, 6b,

6c, 6d) is determined by subtracting either the active electric power ( $P_w$ ) or the reactive electric power ( $Q_w$ ) in the output electric power of the wind power generator (1a, 1b, 1c, 1d) from the electric power of  
5 the electric power system (18).

5. An electric power variation compensating device according to claim 3 or claim 4, characterized in that the electric power variation compensating device further comprises a change-over switch (A, B)  
10 which makes or interrupts the active electric power ( $P_w$ ) or the reactive electric power ( $Q_w$ ) in the output power of the wind power generator (1a, 1b, 1c, 1d), and another change-over switch (C) which makes or interrupts low frequency components ( $P_{wL}$ ) of the  
15 active electric power ( $P_w$ ) or the reactive electric power ( $Q_w$ ) in the output electric power of the wind power generator (1a, 1b, 1c, 1d).

6. An electric power variation compensating device according to one of claims 1 through 5,  
20 characterized in that a superconducting magnetic energy storage device (17a), a static var compensating device (17b) or an adjustable speed electric power generating system (17c) is used as the electric power energy storage device (4a, 4b).

## ABSTRACT OF THE DISCLOSURE

A compound system of a wind power generation and an electric power energy storage constituted by a plurality of wind power generators 1a and 1b, and electric power energy storage device 5a and 5b and electric power converters 6a and 6b installed in parallel with the wind power generators is provided with a composite current detecting means 8a for the wind power generators, a voltage detecting means 9a for an electric power system 18, means 8b for detecting a current of which the electric power converters input or output, means 10a for computing output electric powers  $P_w$  and  $Q_w$  of the wind power generators according to the voltage of the electric power system and the detected value of composite current of the wind power generators, means 10b for computing input or output electric powers  $P_c$  and  $Q_c$  of the electric power converters according to the voltage of the electric power system and the detected value of the current of the electric power converters and a control unit 11a which generates pulse signals 16a for controlling the electric power converters, wherein the output electric power of the wind power generators and the input or output electric power of the electric power converters are used for electric power feed back in a control system for the electric power converters.



FIG. 1

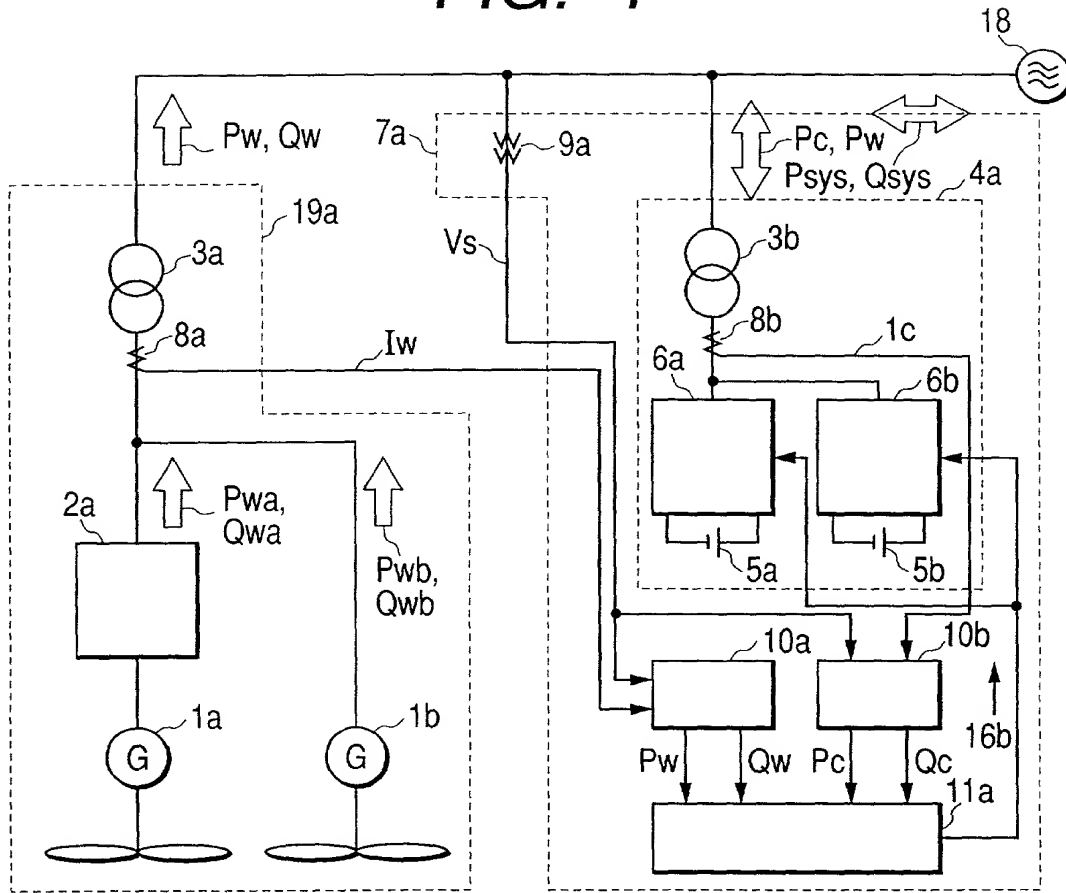
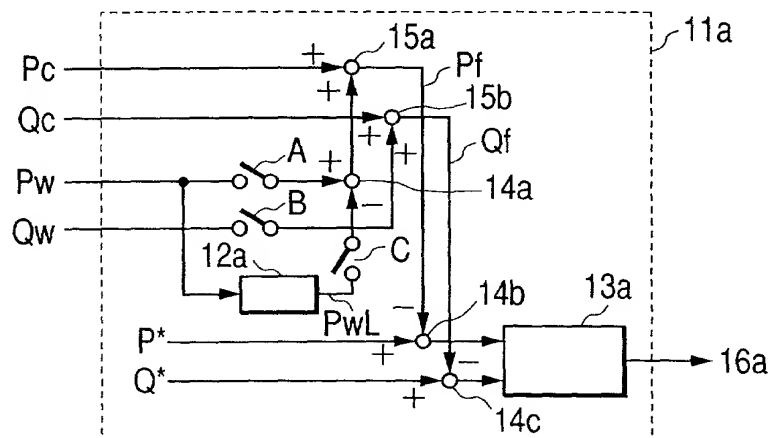


FIG. 2



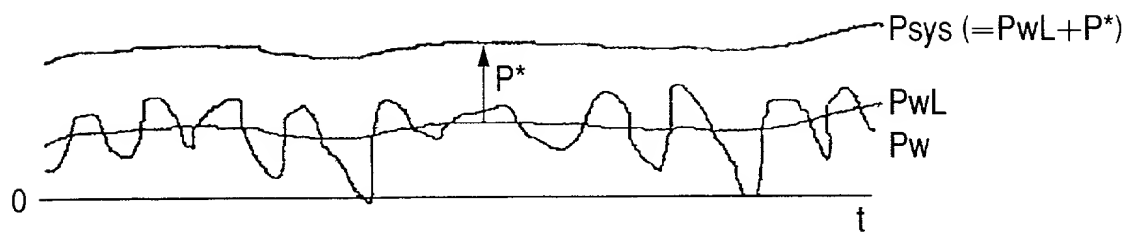
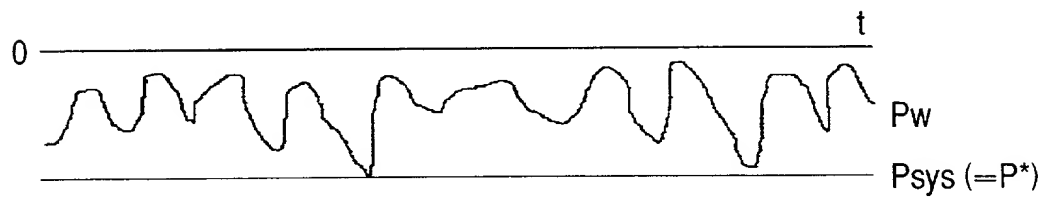
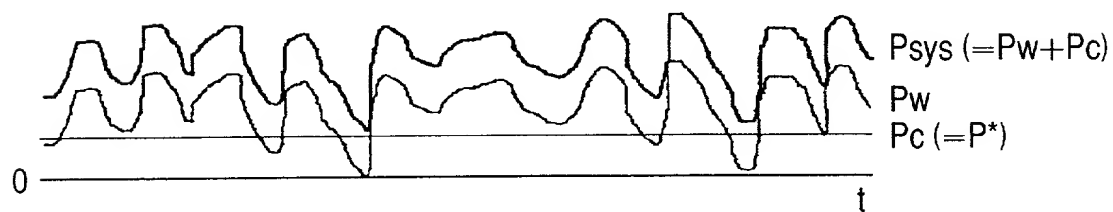
**FIG. 3****FIG. 4****FIG. 5**

FIG. 6

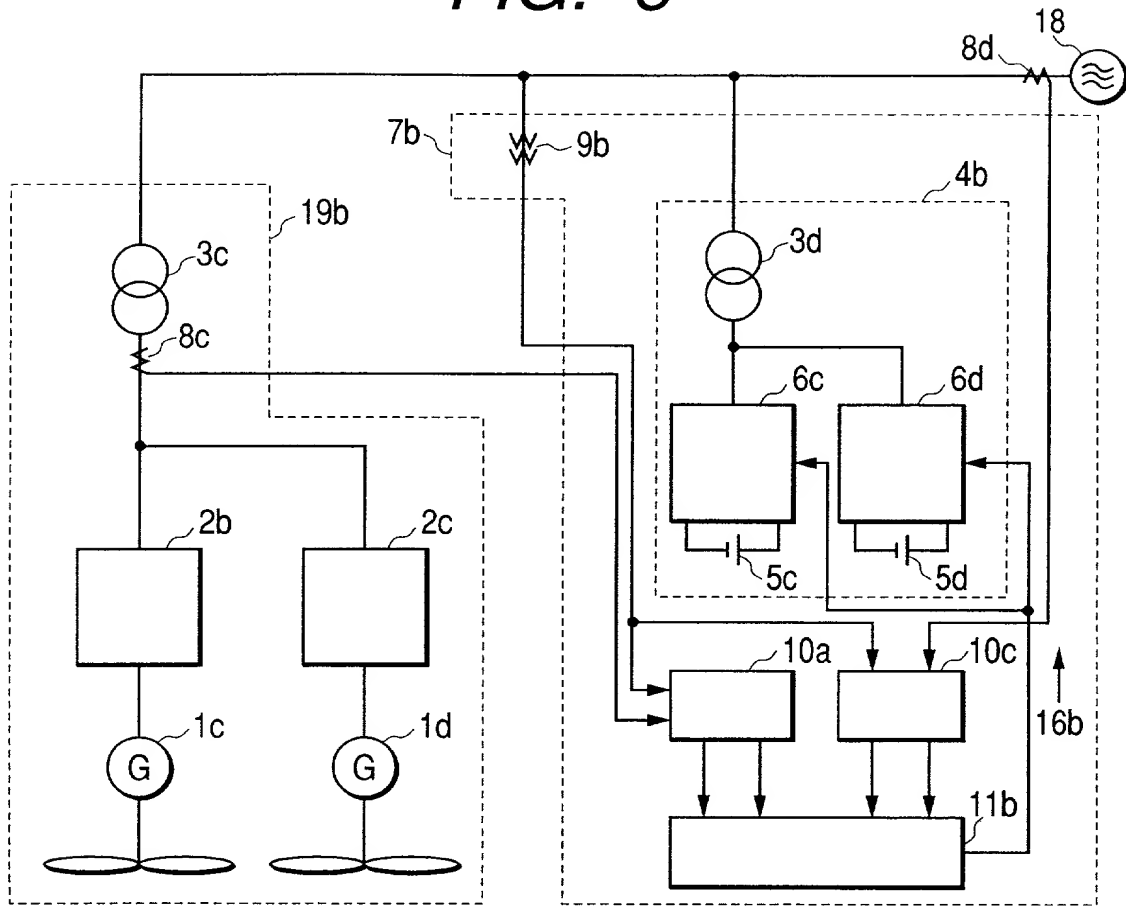


FIG. 7

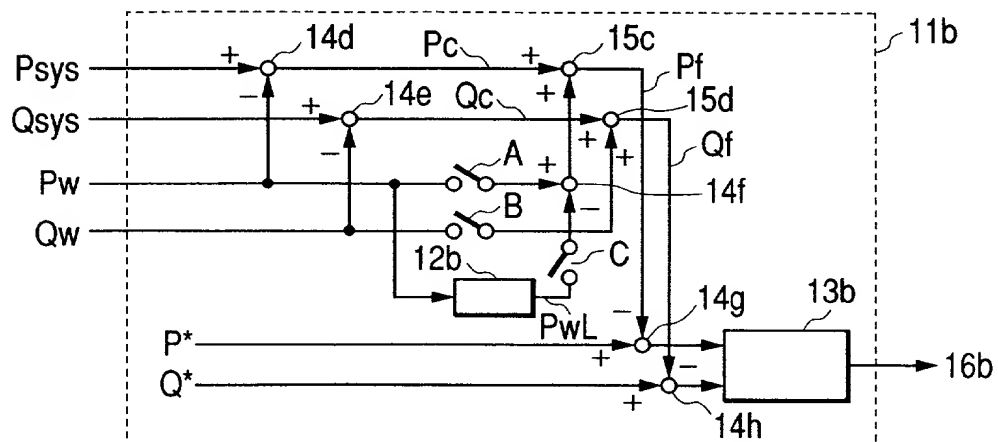


FIG. 8

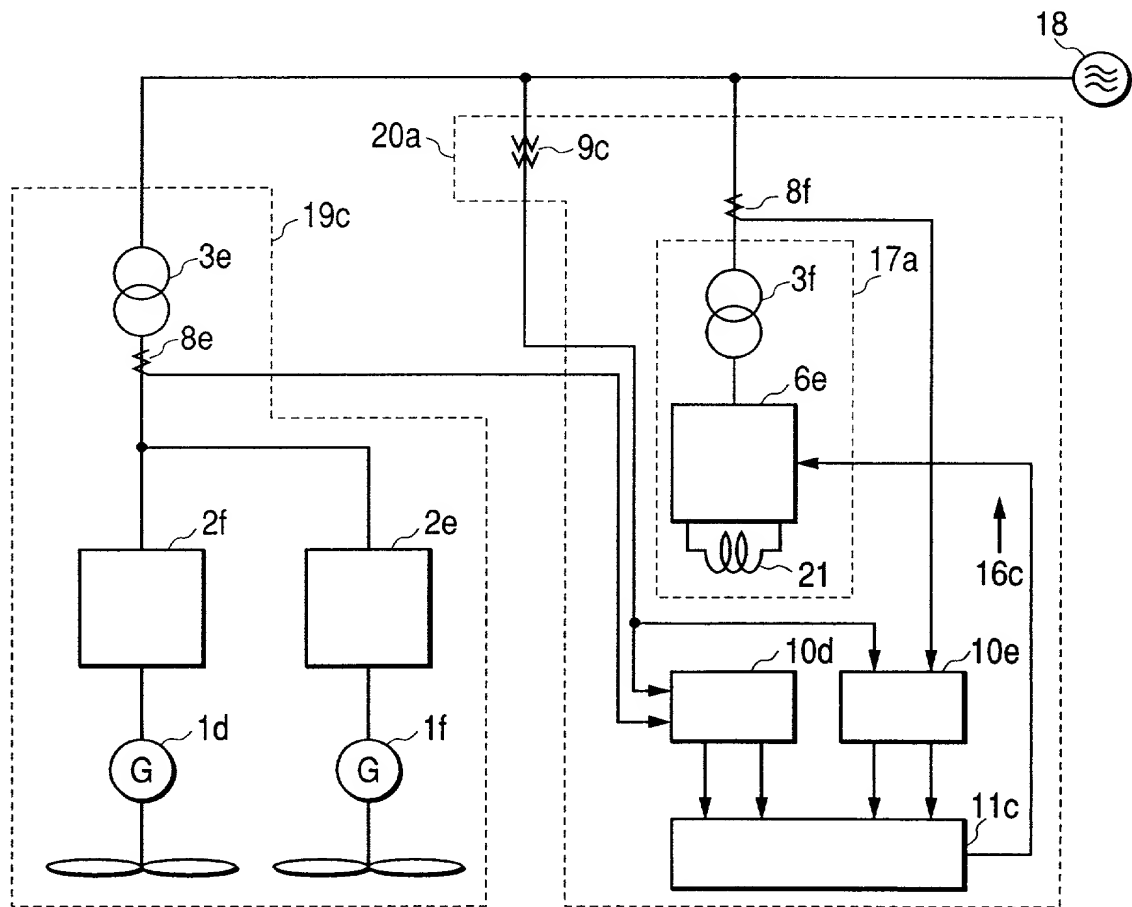


FIG. 9

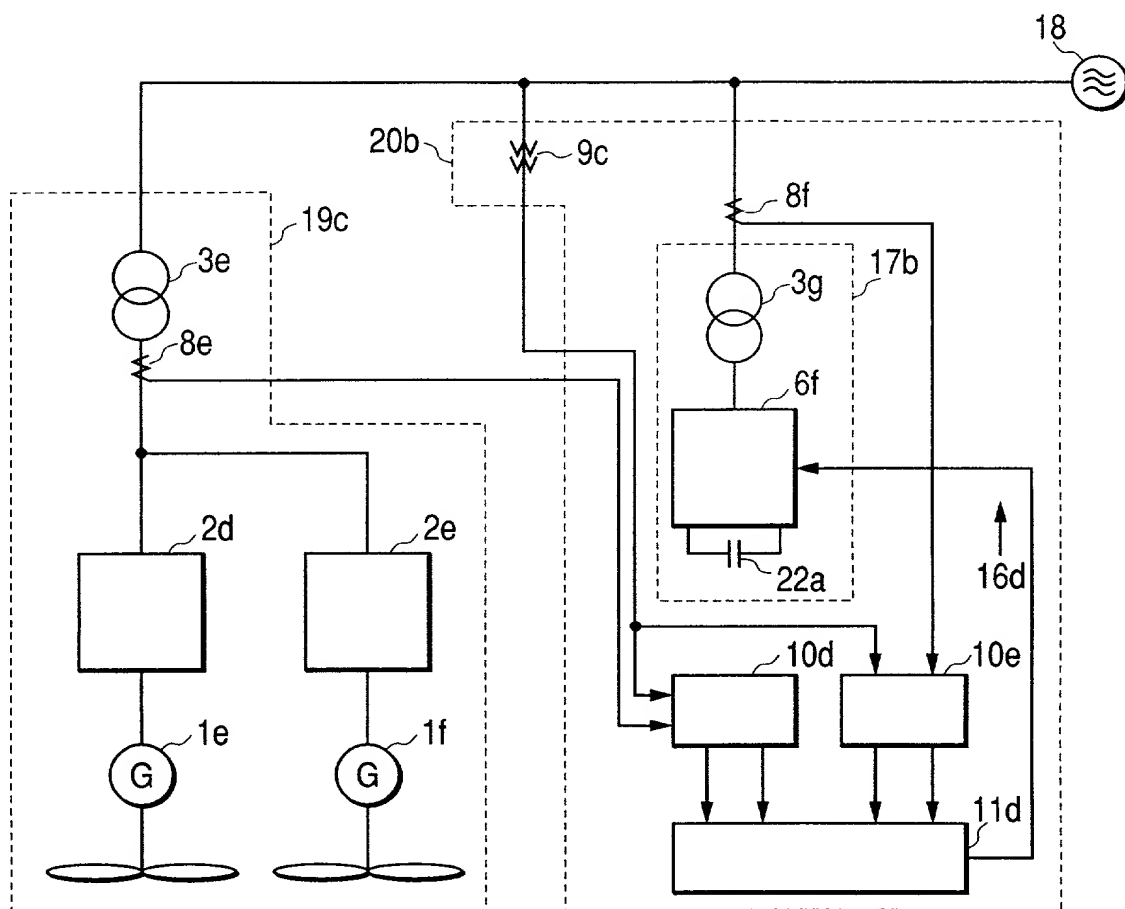
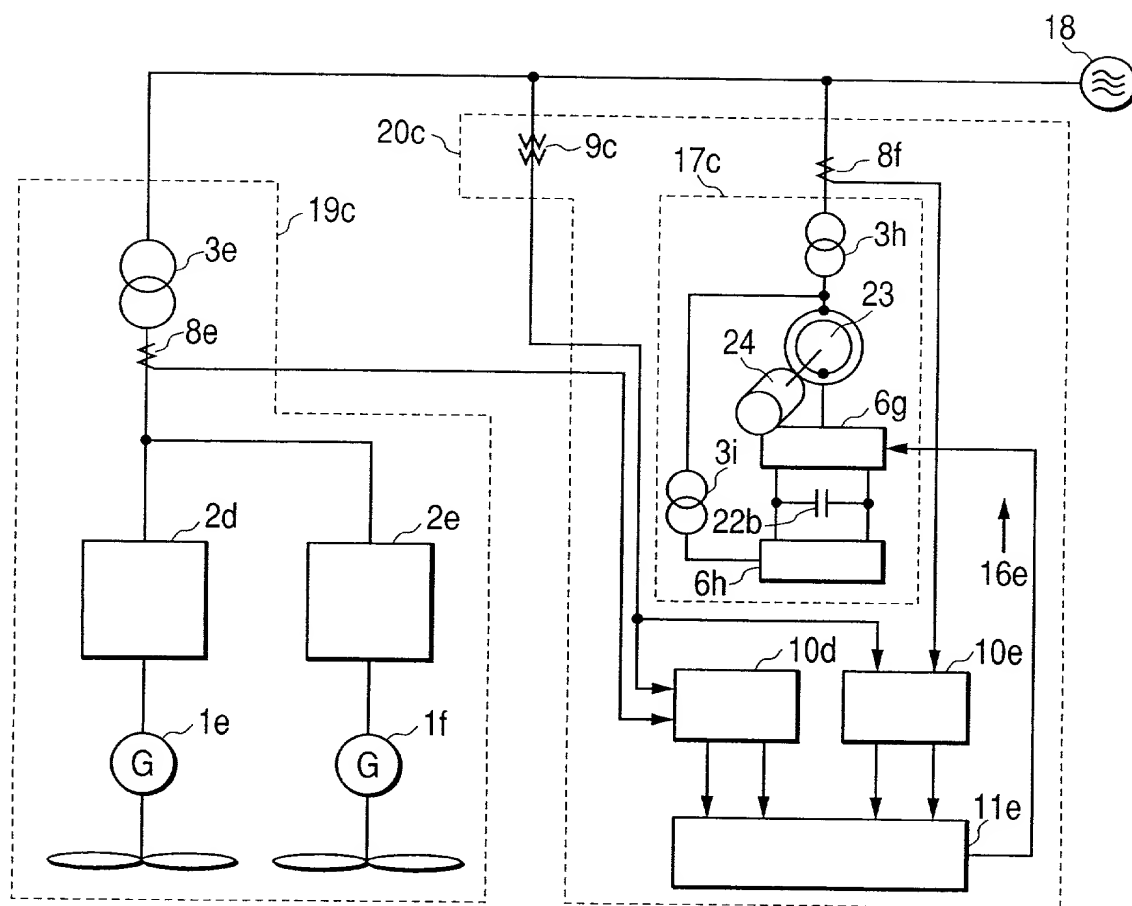


FIG. 10



# DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name, I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

ELECTRIC POWER VARIATION COMPENSATING DEVICE

the specification of which (check one)

☒

is attached hereto.

☐

was filed on \_\_\_\_\_

as Application Serial No. \_\_\_\_\_

and was amended on \_\_\_\_\_

(if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

## Prior Foreign Application(s)

## Priority Claimed

11-14268	Japan	22/01/1999	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

_____	_____	_____
(Application Serial No.)	(Filing Date)	(Status: patented, pending, abandoned)
_____	_____	_____
(Application Serial No.)	(Filing Date)	(Status: patented, pending, abandoned)
_____	_____	_____
(Application Serial No.)	(Filing Date)	(Status: patented, pending, abandoned)
_____	_____	_____
(Application Serial No.)	(Filing Date)	(Status: patented, pending, abandoned)

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United State Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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